Risk Analysis for Wolf-Vehicle Collisions on Proposed Woodland Road in Marquette County

Prepared by:

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About the Author

James Hammill is President of Iron Range Consulting and Services Inc., a company whose main focus is land management for wildlife, timber resources, and a wide range of sustainable resource benefits for private landowners.

Prior to forming the company in 2002, Hammill retired from the Michigan Department of Natural Resources (MDNR) after 30 years of service as the West U.P. Wildlife Division Supervisor. He was deeply involved with monitoring the recovering U.P. gray wolf population from 1985 until his retirement in 2002.

He has published both scientific and popular literature on wolves, served on the MDNR Wolf Recovery Team, monitored wolves in the northeastern United States, and worked on public education regarding wolves for many years. He currently serves on the Board of Directors at the International Wolf Center, Ely, Minnesota, and is the Vice-Chair for North American Wildlife of Safari Club International.

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Introduction

Woodland Road LLC has proposed to construct a multi-use road (a.k.a. Woodland Road), over which logs, ore, aggregates, people, and equipment will be transported between the Triple A Road in Champion Township (T50N-R28W) on the north end, to US-41 in Humboldt Township (T47N-R29W) on the south end. The total length of the proposed roadway is 35.9 km (22.3 miles). This privately constructed road will be open to public use.

Most (90% +/-) of the proposed road route is located on roads and trails that currently exist. Where this occurs, those trails and roads would be upgraded to a standard capable of serving vehicles weighing up to 100 tons at an estimated speed of 72 kph (45 mph). Currently, roads and trails on the proposed route service local vehicular traffic, including logging trucks. Daily vehicle volume of the present use is unknown. Many portions of the proposed roadway are currently not capable of 4-wheel drive traffic but still serve as ATV and snowmobile routes. Approximately 5.6 km (3.5 miles) of the Woodland Road are located on existing Marquette County roads.

In 2008 a survey was conducted along most of the proposed haul route, which documented presence of "large mammals". Ten species of large mammals, including the endangered gray wolf (Canis lupus), were verified to be traveling along or across the proposed road route. At this writing the gray wolf is classified as a federally endangered species. Wolves in Michigan are thought to be isolated to the Upper Peninsula (U.P.), and are part of a meta-population which extends southward to central Wisconsin and westward to central Minnesota. This meta-population was numbered at an estimated 4,250 animals in the spring of 2009. Michigan has an estimated 575 animals (spring 2009) which geographically reside in every Upper Peninsula county. Wolves in the Western Great Lakes States (Michigan included), have surpassed de-listing criteria under both the State and Federal Endangered Species Acts. Currently, inconsistencies in the delisting process have allowed groups opposed to delisting to prevail in court, enjoining the delisting process for the present time. If wolves were removed from endangered classification and delisted, concern for their well-being will likely remain a high profile issue, especially during the five-year long "post de-listing" period. During this time the U.S. Fish and Wildlife Service will require annual reports from states indicating the status of wolves and any new perceived threats to wolves that could cause the population in any of the states to be harmed to the point of re-listing. Further, even though wolves are locally a controversial species, Michigan residents strongly support having a sustainable population of wolves. In most wolf populations, humans are the primary cause of mortality. Illegal shooting, trapping, poisoning, and vehicle-wolf collisions are typically the main sources of man-caused mortality among wild wolves. In this report we will attempt to assess the risk that construction and use of Woodland Road may have on resident wolves from the perspective of the likelihood of wolf-vehicle collisions.

History/Background

Gray wolves are native to Michigan. After centuries of persecution, wolves were extirpated from Michigan's Lower Peninsula at about the turn of the 20th Century. Likewise, they were last known to have produced young in the Upper Peninsula of Michigan in 1954. Wolves were believed to be extirpated, or nearly so, in the U.P. by 1960 and were placed on the Federal Endangered Species List in 1974. However, a natural recovery of U.P. wolves began in the 1980s, augmented by animals immigrating to the area from established populations elsewhere.

The gray wolf population in the Upper Peninsula has been growing steadily since 1990, when the first successful breeding of this recovering population was documented. Prior to 1990 wolves were thought to be infrequent transients from populations elsewhere, most likely Ontario and Minnesota, and breeding had not been documented since 1954. Since 1990 wolves have flourished and now live in every U.P. county. On average their population has increased annually at a rate of 12-15%. The winter 2008-09 estimate of gray wolves in the U.P. was 575 animals. The graph below reflects the population trajectory of gray wolves in the U.P. from 1989 to 2009 (Figure 1).

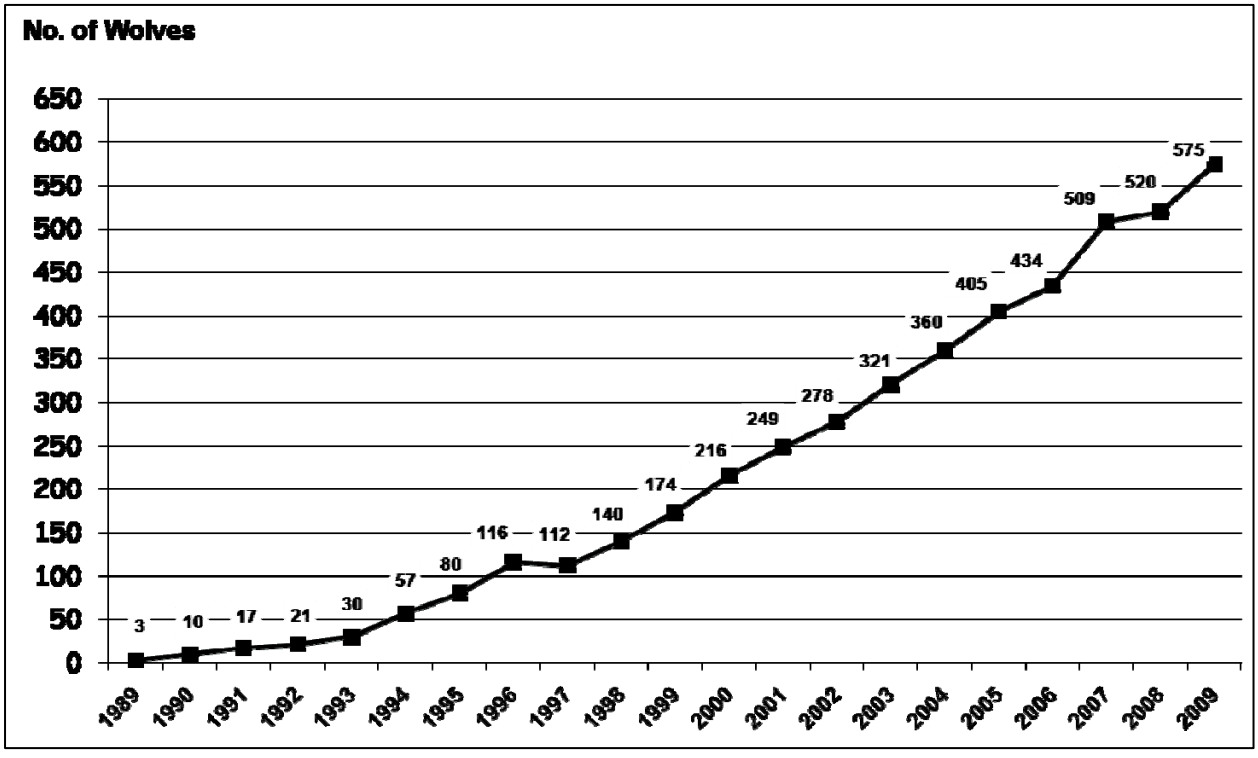

Figure 1. Upper Peninsula Wolf Minimum Winter Population Estimates 1989-2009.

Methods

In this paper we summarize some of the wolf research relevant to roading and its impact on wolves. Also, we examine past records of wolf-vehicle accidents in the Upper Peninsula. This historic wolf-vehicle accident data was obtained by the Freedom of Information Act (FOIA) from the Michigan Department of Natural Resources records. During the period 1989-2000 inclusive, 83 wolf-vehicle collisions occurred in the U.P. which resulted in the wolf being killed. Of those records, 78 had sufficient data usable for our purposes in this effort. Through the assistance of Dr. Robert Legg of Northern Michigan University's Geography Department, Michigan Department of Natural Resources records of wolf-vehicle collisions were superimposed on Upper Peninsula highway system maps. Michigan Department of Transportation 24-Hour Traffic Volume data were used to add another layer of analysis. The resulting maps (Figures 2 and 3), are shown on pages 7 and 8.

Our primary focus in this report is to answer the following questions:

1) What type of roads (i.e., interstate, state, county, or unimproved secondary roads) have wolves most often been on when wolf-vehicle collisions have occurred?
2) Are wolf kills by vehicles related to highway speeds?
3) Is the rate at which wolves are killed related to 24-hour traffic volumes?

With this information we intend to describe typical roadway characteristics where wolf-vehicle collisions have most frequently occurred using historical highway data from wolf-vehicle collision sites. Comparisons of the typical wolf-vehicle kill site roadway can then be used as a contrast to the intended characteristics of the proposed Woodland Road.

We will also examine wolf-vehicle accident literature and past work related to wolves and roading in general. Because of the myriad of variables that exist in such an analysis, statistical tests of probability in this risk analysis are inappropriate. However, analysis of this type can allow us to describe a general "model" of the type of road and traffic patterns most often seen at wolf-vehicle kill sites and make inferences to the probability of vehicle-wolf collisions on the proposed Woodland Road.

Analysis

Roads have long been recognized as having the potential to have significant impact on wildlife resources (Jaeger et al. 2005). In the Great Lakes States roads have been shown to have a negative effect on habitat suitability for gray wolves (Thiel 1985; Jensen et al. 1986; Mech et al. 1988; Mladenoff and Sickley 1998). In addition to having a direct negative effect, roads may provide more and easier access to humans that may be intolerant of wolves, a critical factor in wolf survival.

Availability of prey is a life requisite that is crucial to the presence and sustainability of wolf populations. In areas where potential prey is absent or in very low numbers, wolves are less likely to inhabit the area. In these areas, the presence of roads will have a lesser impact on wolves.

Wolves often use roads to travel from one portion of their range to another. Normally these roads are little-used woods roads. Wolves tend to avoid heavily-traveled paved roads, especially high speed roads with higher traffic volumes, which are the most likely sites for wolf-vehicle accidents. However during winter, plowed roads or those with compacted snow surfaces are used more frequently. These roads are likely to reduce energetic costs for wolves during deep snow periods when cross country travel is taxing.

Interstate movement of wolves has been common during the period of wolf population recovery (1980-2009) in the Western Great Lakes states. Dispersing wolves from Great Lakes populations have successfully encountered and crossed many high speed state and interstate road systems. These dispersers traversing unfamiliar territory are particularly vulnerable to vehicle-wolf collisions. Although many of these animals successfully crossed highway systems with extremely high volumes of traffic and high speed limits, a number of these long distance dispersers were eventually killed by collisions with vehicles.

Roads and traffic may at times intimidate dispersing wolves and prevent unoccupied but otherwise suitable habitat from being colonized. Roads may also be a significant enough barrier to cause wolves to limit their territories, using major high speed, higher traffic roads as boundaries, thereby limiting the necessity for crossing these roads (Kohn et al. 2000).

Although wolves have been shown to cross nearly every type of road (Mech et al. 1995), it seems logical that wolves would be more reluctant to cross some types than others. Research has shown that wolves use areas with roads having low use and even use closed roads as travel corridors while avoiding high use roads (Thurber et al. 1994; Whittington et al. 2005).

Within wolf home ranges, critical habitat may be described as den sites, where the wolf pups are born, and rendezvous sites, where the pups are raised. Research in Wisconsin has shown that wolves tend to avoid roaded areas when selecting den sites (Unger 1999; Keenlance 2002). Presently, no wolf rendezvous or den sites are known to exist within 5 miles of the entire length of the proposed Woodland Road system.

Greater traffic volumes and higher vehicle speeds as the result of upgrading existing roads to higher standards can have a negative impact on resident wolves (Fuller 1995). However, Wisconsin upgraded 44 miles of Highway 53 from a 2-lane to a 4-lane divided highway. In Wisconsin's Highway 53 research project area, wolves persisted, crossing the high speed divided four-lane route and continuing to use this area as a major immigration/emigration site between Minnesota and Wisconsin as they did prior to the expansion and upgrade of the formerly two-lane road. The Wisconsin Highway 53 research study did provide some recommendations for future highway development projects in wolf habitat (Wisconsin Department of Transportation 1990). These recommendations are listed below and their applicability to the Woodland Road proposal is shown.

The report states that highway projects should:

1) *Follow existing road corridors to avoid increasing roadway density and altering habitat.*
   To the extent possible, this has been done on the Woodland Road project proposal. Of the 22.3 miles of proposed road, 90% will be an upgrade of existing roads and trails.

2) *Existing wolf pack territories in the immediate area should be considered when selecting highway alignment alternatives.*
   Since very limited radio-telemetry data is available for wolves in this area, it is hard to ascertain how many pack territories may exist here. Likewise, because of its remoteness, this area is often not as thoroughly censused during winter months to determine presence of wolves. However, from summer tracking in 2008, it appears that two packs likely exist along the proposed route. It is most likely that wolves from the proposed Woodland Road route follow migrating deer to winter range either north or south of their summer range and are not present during the winter months. In addition, suitable alternatives to the proposed Woodland Road route do not exist and creation of an entirely new route would more significantly impact endangered wildlife than would the proposed route.

3) *Locating new highways (or presumably upgrading existing ones), should avoid core areas of known pack territories, especially avoiding areas of prime denning habitat.*
   No known wolf den or rendezvous sites exist within 5 miles of any point on the proposed Woodland Road route.

4) *High probability crossing sites for wolves should be identified and signed with "wildlife crossing area" signs to alert drivers that the probability of encountering wolves is greater in that area.*
   Any high probability wolf crossing sites identified along the proposed route can be signed appropriately.

5) *Removal from the right of way of carcasses of vehicle killed ungulates such as deer or moose would provide an extra measure of safety for endangered predators (such as wolves) and scavengers (such as bald eagles).*
   This recommendation can also be followed.

Discussion

Wolf Home Ranges

There are several variables that may contribute to the possibility of wolf-vehicle collisions. One of those variables is the overall wolf population of the area (e.g., county). Wolves have been documented to be present along the proposed road corridor. However, this documentation was done during the spring-fall period. It is not known if wolves are present in this general area during the winter months. The wolf's primary food resource (white-tailed deer) vacate all or most of the landscape surrounding the road corridor during winter. These deer likely migrate either north or south to better winter "yarding" habitat. In other studies wolves have been shown to follow migrating deer to their winter yarding areas (Theberge 1998). In these studies wolves

and deer that occupied the same spring-fall range moved in unison to winter range only to return when deep snow of winter subsided.

Very little radio location data are available for wolves in northern Marquette County and there has been, to date, little effort made to radio-collar wolves in this area. Therefore, it is impossible to determine the changes, if any, in winter versus spring-fall range of these animals. However, from anecdotal evidence elsewhere in the U.P. and studies done under similar conditions, it is likely that wolves would not be present along the proposed Woodland Road corridor for a significant part of the year coinciding with the winter deer "yarding" period.

Another variable related to likelihood of wolves being present on or near any road is the possibility that the particular area is a high use wolf area, such as the "core" area of a pack or an area near a den or rendezvous site. No such area occurs along the Woodland Road to our knowledge.

Vehicle Speed and Traffic Volume

Vehicle speed and wolf density appear to be inordinately important in the risk of wolf-vehicle collisions. The Upper Peninsula has a limited amount (about 70 miles) of expressway where speed limit of 70 mph applies. Major state highways and county roads have a speed limit of 55 mph which we will consider here high-speed roads by U.P. standards. In our sample (N=78) ninety-one percent (91%) of the historical wolf-vehicle collisions in the U.P. occurred on roads with a posted speed limit of 55 mph or above. Speed limits on the proposed Woodland Road would be no higher than 45 mph.

Traffic volume also appears to be a factor. Clusters of sites where wolves have been killed by vehicles appear to be correlated with relatively high traffic volumes. As examples, refer to Figures 2 and 3 that show clusters of collisions sites in the Escanaba area (Delta County); south of L'Anse on Highway US-41 (Baraga County); and on M-77 between US-2 and M-28 in (Mackinac County). All these sites have documented traffic volumes far above what is expected on the proposed Woodland Road. It is expected that 220 round-trips will be made daily, on average, as a result of logging, mining, aggregate and recreational activities on this proposed road. Traffic associated with logging, mining, aggregate, and other vehicular traffic expected to use the Woodland Road will be at levels far below those areas of documented wolf mortality on roads in the U.P.

Historically, Marquette County has had a low incidence of wolf-vehicle collisions. Only two of seventy-eight recorded wolf-vehicle collisions in our sample resulting in the death of the animal have occurred in Marquette County. This represents only 2% of known mortality from this cause. Although Marquette County has the largest land area in the U.P., comparatively high traffic volumes in many parts of the county, and a substantial amount of high speed roads, the county is "under represented" in wolf mortality due to wolf-vehicle collisions. Our interpretation of these data is that wolf-vehicle collisions are relatively rare in Marquette County because the density of wolves in the county is low, and core areas of wolf use in the county may not currently be associated with high traffic volume, high speed roads.

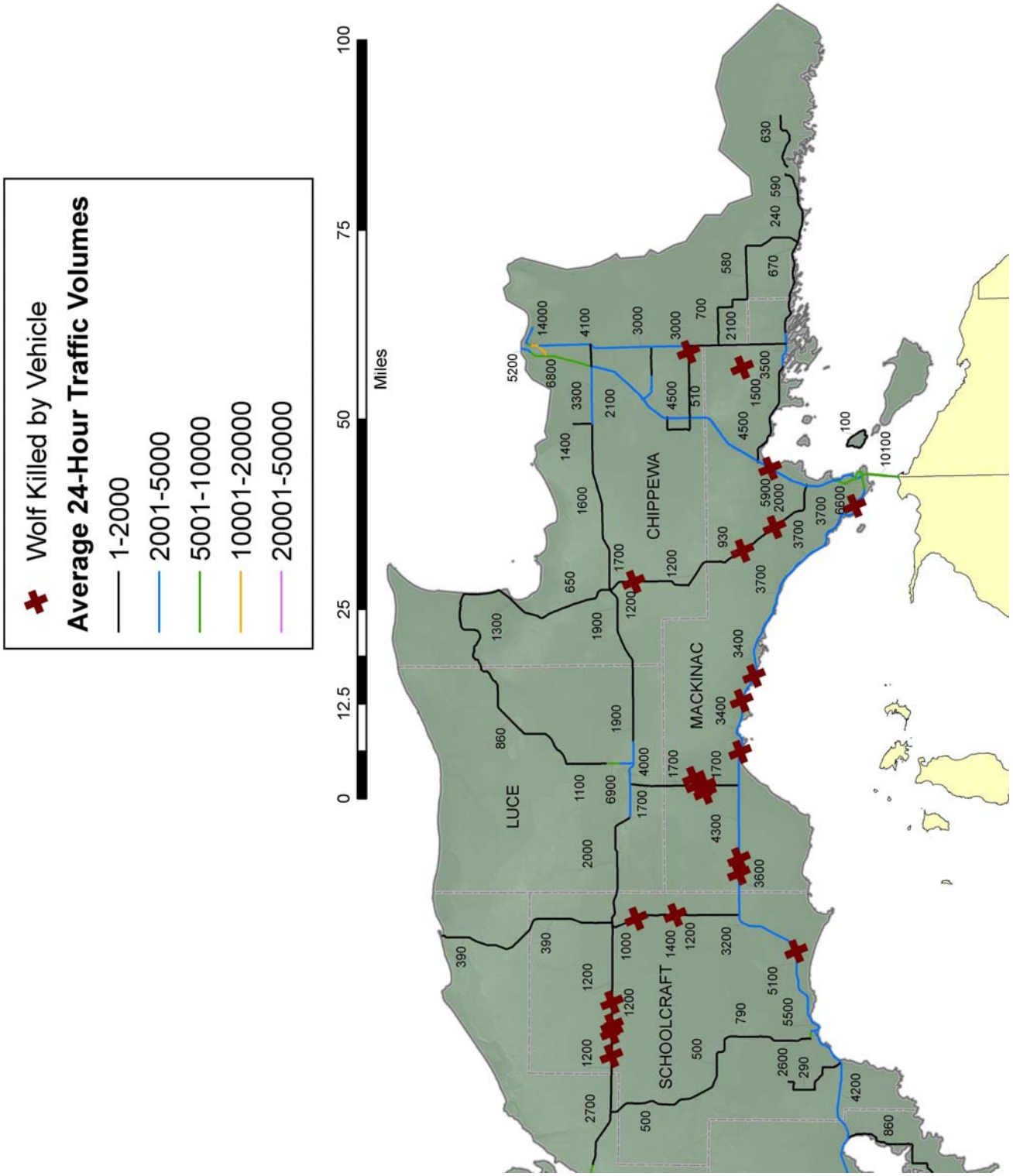

Figure 2. *Locations of wolves hit and killed by vehicles compared to Average 24-Hour Traffic Volumes, east half of Upper Peninsula, 1989-2009.*

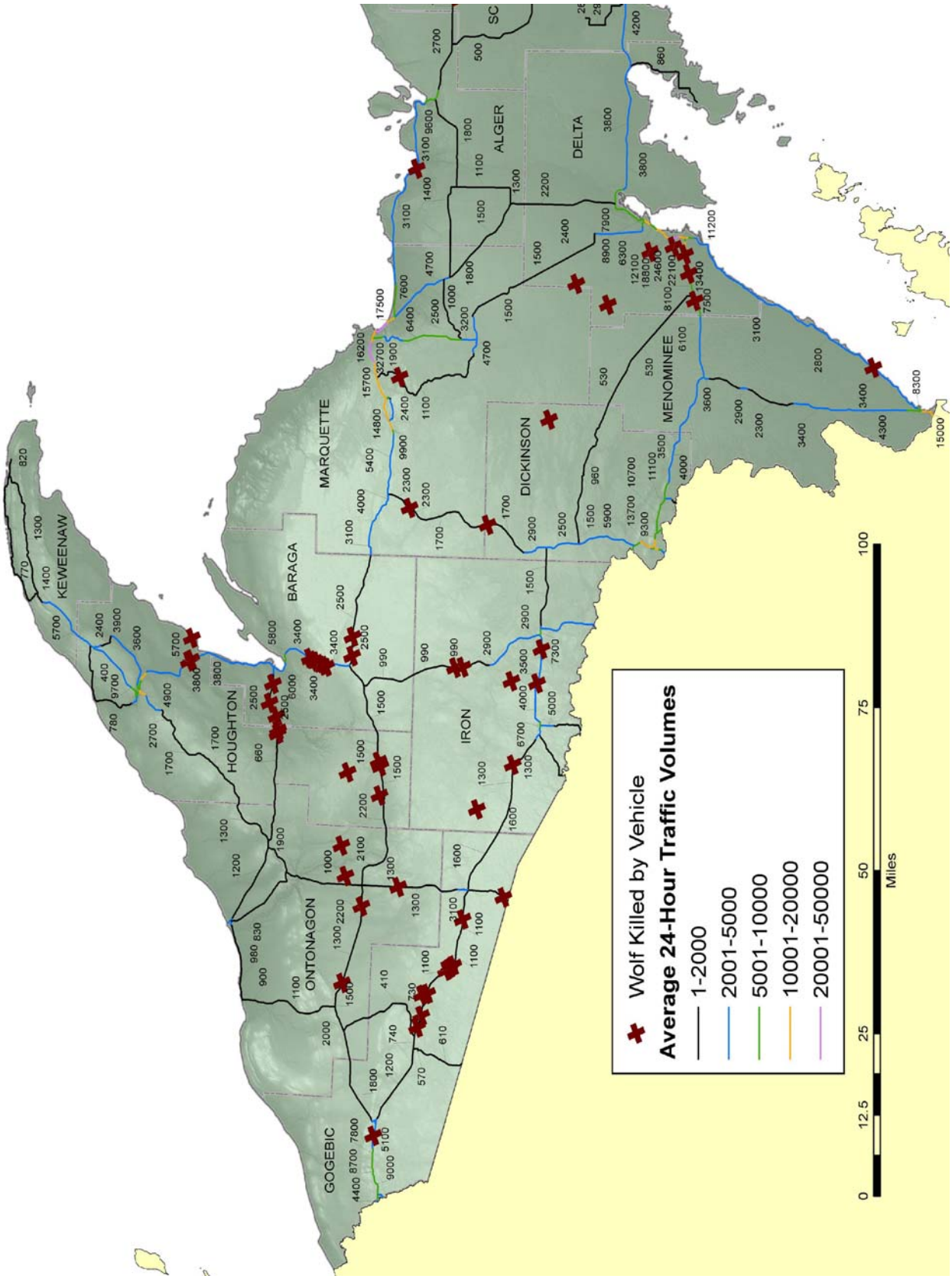

Figure 3. *Locations of wolves hit and killed by vehicles compared to Average 24-Hour Traffic Volumes, west half of Upper Peninsula, 1989-2009.*

Road Profile

Figure 4 shows the proposed profile for Woodland Road. Past studies have shown that wolves tend to cross highways in lowland areas where they also have a good view of the roadway in both directions. After receiving planned road profiles for the entire 22.3 miles of proposed Woodland Road, it appears that at least three areas are likely crossing sites that wolves would use based on the criteria above. If truckers were made aware of this possibility or if wildlife crossing signs were erected in these areas, it would further serve to alert drivers of the possibility of collisions.

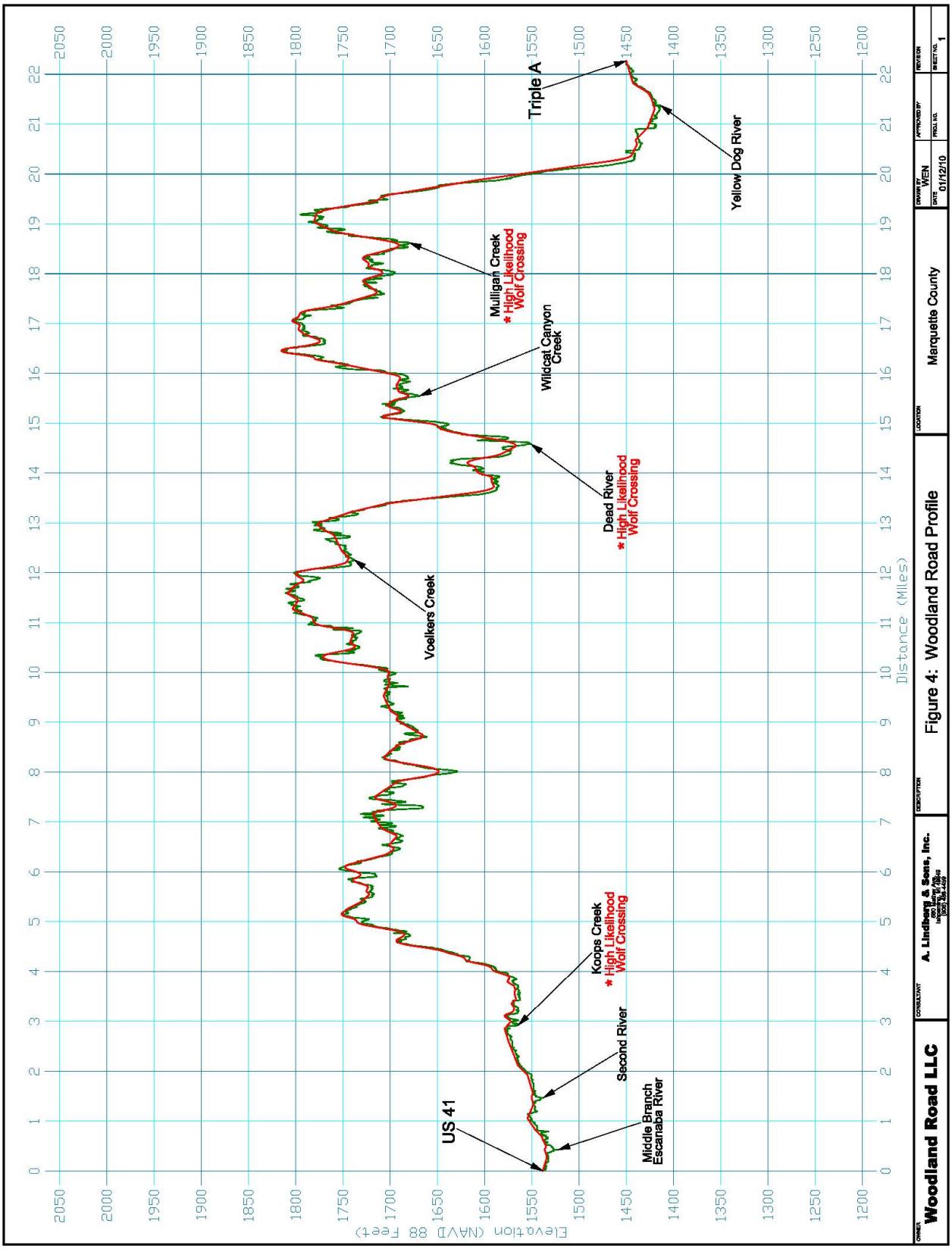

Figure 4. *Woodland Road profile showing probable wolf crossing locations.*

Summary

Because of the many factors that may contribute to wolf vulnerability, it is impossible to say with absolute certainty that a wolf-vehicle collision will not occur as a result of the upgrade and increased use that will be made of the proposed Woodland Road. However, in consideration of all aforementioned factors and available research data on wolf-vehicle collisions, we believe that the likelihood of a wolf-vehicle collision occurrence on the proposed Woodland Road is remote. This opinion is based on the following:

1) Most wolf-vehicle accidents occur on "high speed" roads with speed limits of 55 mph or greater. Woodland Road speed limit will be 45 mph.

2) Most wolf-vehicle collisions occur on roads that, by U.P. standards, have moderate to heavy daily traffic volumes. The proposed Woodland Road is expected to have 24-hour traffic volumes of approximately 440 vehicles, significantly less than U.P. roads where wolves have been killed.

3) Wolf-vehicle collisions most often occur in areas of high wolf density or on highways that transect critical habitats for wolves. No known critical habitat such as den or rendezvous sites occurs along the Woodland Road corridor. Further, wolf density in the uplands of northern Marquette County appears to be sparse in comparison to many other areas in the U.P.

4) Mitigation efforts can be undertaken to educate drivers and signage can be placed at high likelihood wolf crossing sites. These efforts could be incorporated into a road use plan that may further decrease the potential for wolf-vehicle collisions.

This risk analysis is consistent with historical records of wolf-vehicle accidents and the available literature on the topic. The information provides a good overview of risk factors, none of which seem to be present in the proposed project area. It appears that the proposed Woodland Road does not fit the typical profile of roads where wolf-vehicle collisions have occurred.

References

Fuller, T. K. 1995. Guidelines for gray wolf management in the northern Great Lakes Region. Ely, MN: International Wolf Center Technical Publication 271.

Jaeger, J. A., Bowman, G. J., Brennan, J., Fahrig, K., Bert, D., Bouchard, J., Charbonneau, N., Frank, K. Gruber, B., and Tluk von Toschanowitz, K. 2005. Predicting when animal populations are at risk from roads: an interactive model of road avoidance behavior. Ecological Modeling 185:329-348.

Jensen, W. F., Fuller, T. K., and Robinson, W. L. 1986. Wolf (*Canis lupus*) distribution on the Ontario-Michigan border near Sault Ste. Marie. Canadian Field-Naturalist. 100:363-366.

Keenlance, P. W. 2002. Resource selection of recolonizing gray wolves in northwest Wisconsin. PhD Dissertation, Michigan State University, Lansing, MI.

Kohn, B. E., Frair, J. L., Unger, D. E., Gehring, T. M., Shelley, D. P., Anderson, E. M., and Keenlance, P. W. 2000. Impacts of the US Highway 53 expansion project on wolves in north-western Wisconsin. Wisconsin Department of Natural Resources Final Report.

Mech, L. D., Fritts, S. H., Radde, G. L., and Paul, W. J. 1988. Wolf distribution and road density in Minnesota. Wildlife Society Bulletin 16:85-87.

Mech, L. D., Fritts, S. H., and Wagner, D. 1995. Minnesota wolf dispersal into Wisconsin and Michigan. American Midland Naturalist 133:368-370.

Mladenoff, D. J., and Sickley, T. A. 1998. Assessing potential gray wolf habitat restoration in the northeastern United States: a special prediction of favorable habitat and potential population levels. Journal of Wildlife Management 62:1-10.

Thiel, R. P. 1985. The relationship between road densities and wolf habitat suitability in Wisconsin. American Midland Naturalist 113:404-407.

Thurber, J. A., Peterson, R. O., Drummer, T. D., and Thomasma, S. A. 1994. Gray wolf response to refuge boundaries and roads in Alaska. Wildlife Society Bulletin 22:61-68.

Unger, D. E. 1999. Timber wolf den and rendezvous site selection in northwestern Wisconsin and east-central Minnesota. MS Thesis, University of Wisconsin – Stevens Point, WI.

Whittington, J., St. Clair, C. C., and Mercer, G. 2005. Spatial responses of wolves to roads and trails in mountain valleys. Ecological Applications 15:543-553.

Wisconsin Department of Transportation. 1990. Eastern timber wolf biological assessment for U.S. Highway 53. Federal Project F 108; I.D. 1198-01-01/02.

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